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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/527,642	03/14/2005	Masanobu Igeta	267410US26PCT	7107
22850	7590	09/27/2007	EXAMINER	
OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C.			LEE, CHEUNG	
1940 DUKE STREET			ART UNIT	PAPER NUMBER
ALEXANDRIA, VA 22314			2812	
			NOTIFICATION DATE	DELIVERY MODE
			09/27/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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**Office Action Summary**

Application No.

10/527,642

Applicant(s)

IGETA ET AL.

Examiner

Cheung Lee

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 03 July 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 4,7 and 21-25 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 25 is/are allowed.
- 6) ☒ Claim(s) 4,7,21 and 23 is/are rejected.
- 7) ☒ Claim(s) 22 and 24 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 March 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
  - 2) ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

***Notice to Applicant***

1. Applicants' Amendment and Response to the Office Action mailed on April 3, 2007 has been entered and made of record.

***Response to Amendment***

2. In view of applicants' amendments and arguments filed on July 3, 2007, the rejections of claims 1-15 under 35 U.S.C. 102(e) or 103(a) as stated in the indicated Office Action have been withdrawn. Applicants' arguments have been rendered moot in view of the new or modified ground of rejection given below.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

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consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 4 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Werkhoven et al. (US Pub. 2001/0041250; hereinafter "Werkhoven") in view of Mogami et al. (US Pat. 6459126; hereinafter "Mogami").

4. Referring to figures 1-12 and related text, Werkhoven discloses [Re claim 4] a method for forming an insulating film (page 3, paragraph 32) on a silicon-containing substrate 16 (page 4, paragraph 42) to be processed, comprising: forming a gas mixture by mixing a nitrogen containing gas and an oxygen containing gas (page 4, paragraph 46), the nitrogen containing gas being a nitrogen gas or a nitrogen compound gas and the oxygen containing gas being an oxygen or an oxygen compound gas (page 4, paragraph 46); exciting the gas mixture using a plasma to produce nitrogen radicals and oxygen radicals (page 4, paragraph 48; page 5, paragraph 60); supplying the nitrogen radicals and the oxygen radicals to a surface of the substrate (page 5, paragraph 60); wherein, when the gas mixture is formed, the gas mixture ratio between oxygen containing gas and the nitrogen containing gas varies with time (page 5, paragraph 55; page 6, paragraph 68; see fig. 8), but Werkhoven fails to disclose expressly wherein exciting the gas mixture using a high frequency plasma and creating an insulating film containing nitrogen using the nitrogen radicals and the oxygen radicals on the surface of the substrate.

Referring to figures 1-18 and related text, Mogami discloses wherein forming nitrogen radicals and oxygen radicals (col. 5, lines 55-67) using a high frequency plasma (col. 17, line 65-col. 18, line 5); and creating an insulating film 42 containing nitrogen (col. 17, lines 37-50) with nitrogen radicals and oxygen radicals (col. 17, lines 37-50) on a surface of a substrate (see fig. 9A). Also, Werkhoven discloses oxygen and nitrogen radicals created to provide to the oxygen and/or nitrogen phases of the process (page 5, paragraph 60). Therefore, the nitrogen and oxygen radicals are used to create an insulating film.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use nitrogen and oxygen radicals to create an insulating film, as taught by Mogami, because it would have been to obtain low temperature process and boosted reaction (Werkhoven, page 5, paragraph 60).

5. Referring to figures 1-12 and related text, Werkhoven discloses [Re claim 21] a method for forming an insulating film (page 3, paragraph 32) on a silicon-containing substrate 16 (page 4, paragraph 42) to be processed, comprising: forming a gas mixture by mixing a nitrogen containing gas and an oxygen containing gas (page 4, paragraph 46), the nitrogen containing gas being a nitrogen gas or a nitrogen compound gas and the oxygen containing gas being an oxygen or an oxygen compound gas (page 4, paragraph 46); exciting the gas mixture using a plasma to produce nitrogen radicals and oxygen radicals (page 4, paragraph 48; page 5, paragraph 60); supplying the nitrogen radicals and the oxygen radicals to a surface of the substrate (page 5, paragraph 60); wherein when the gas mixture is formed, at least one of the oxygen containing gas and

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nitrogen containing gas is provided intermittently (page 6, paragraphs 71-72; see fig. 7), but Werkhoven fails to disclose expressly wherein exciting the gas mixture using a high frequency plasma and creating an insulating film containing nitrogen using the nitrogen radicals and the oxygen radicals on the surface of the substrate.

Referring to figures 1-18 and related text, Mogami discloses wherein forming nitrogen radicals and oxygen radicals (col. 5, lines 55-67) using a high frequency plasma (col. 17, line 65-col. 18, line 5); and creating an insulating film 42 containing nitrogen (col. 17, lines 37-50) with nitrogen radicals and oxygen radicals (col. 17, lines 37-50) on a surface of a substrate (see fig. 9A). Also, Werkhoven discloses oxygen and nitrogen radicals created to provide to the oxygen and/or nitrogen phases of the process (page 5, paragraph 60). Therefore, the nitrogen and oxygen radicals are used to create an insulating film. The motivation stated in claim 4 also applies.

6. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Werkhoven in view of Mogami as applied to claim 4 above, and further in view of Jackson (US Pub. 2003/0146310).

7. [Re claim 7] The combined teaching of Werkhoven and Mogami fails to disclose expressly wherein the high frequency plasma is produced by exciting the nitrogen gas and the oxygen gas at a frequency of 400 kHz – 500 kHz.

Jackson discloses high energy plasma producing oxygen radicals and nitrogen radicals (page 3, paragraph 17), and high frequencies which range from 50 kHz to 4 MHz (page 4, paragraph 28).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use a certain range of high frequency range, as taught by Jackson, because it would have been to produce high-pressure plasma at input voltages of 5kV or greater (Jackson, page 3, paragraph 17).

8. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Werkhoven in view of Mogami as applied to claim 21 above, and further in view of Raaijmakers (US Pat. 6511539).

9. [Re claim 23] The combined teaching of Werkhoven and Mogami fails to disclose expressly wherein the nitrogen radicals and the oxygen radicals are supplied onto the substrate to flow along the surface of the substrate.

Referring to figure 1 and related text, Raaijmakers discloses a carrier gas flow 13, which carries reactant A and radicals B\* into a chamber passing in contact with a substrate 5 (col. 5, line 60-col. 6, line 5; col. 6, lines 45-50; see fig. 1), and which flows from one side to another side of the substrate (see arrows in fig. 1).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to flow gases along a surface of a substrate, as taught by Raaijmakers, because it would have been to obtain reactants contacting with a substrate surface (Raaijmakers, col. 6, line 1) to rapidly form a film on the substrate surface.

***Allowable Subject Matter***

10. Claims 22 and 24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: claim 22 recites wherein, when the gas mixture is formed, a ratio between a gas supplying time and a gas stoppage time for each of said at least one of the oxygen containing gas and the nitrogen containing gas varies with time, the gas supplying time being an amount of time during which each of said at least one of the oxygen containing gas and the nitrogen containing gas is supplied, and the gas stoppage time being an amount of time during which each of said at least one of the oxygen containing gas and the nitrogen containing gas is not supplied.

These features in combination with the other elements of the base claim are neither disclosed nor suggested by the prior art of record.

Claim 24 depends from claim 22, so it is objected for the same reason.

11. Claim 25 is allowed.

The following is an examiner's statement of reasons for allowance: claim 25 recites wherein the gas mixture ratio between the oxygen containing gas and the nitrogen containing gas is controlled by adjusting a ratio between a gas supplying time and a gas stoppage time for each of said at least one of the oxygen containing gas and the nitrogen containing gas, the gas supplying time being an amount of time during which each of said at least one of the oxygen containing gas and the nitrogen



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containing gas is being supplied to the gas mixing unit, and the gas stoppage time being an amount of time during which each of said at least one of the oxygen containing gas and the nitrogen containing gas is not supplied to the gas mixing unit.

These features in combination with the other elements of the claim are neither disclosed nor suggested by the prior art of record.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cheung Lee whose telephone number is 571-272-5977. The examiner can normally be reached on Monday through Friday from 8:30AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt can be reached on 571-272-1873. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Cheung Lee

September 20, 2007

  
MICHAEL LEBENTRITT  
SUPERVISORY PATENT EXAMINER